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STRATEGY RESEARCH PROJECT

THE RELATIONSHIP OF CENTER OF GRAVITY ANALYSIS, TARGETING FOR EFFECT, AND MEASURING SUCCESS

BY

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The Relationship of Center of Gravity Analysis, Targeting for Effect, and Measuring

Success

by

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ABSTRACT

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TITLE: The Relationship of Center of Gravity Analysis, Targeting for Effect, and

Measuring Success

FORMAT: Strategy Research Project

DATE: 23 January 1998 PAGES: 20 CLASSIFICATION: Unclassified

A key aspect of developing and executing military strategy is an intimate understanding of the interrelationships of center of gravity (COG) analysis, targeting for effect, and measuring success as well as the conditions necessary for effective application of these concepts. The goal of any strategy is to achieve the most decisive, far-reaching effects against the adversary with maximum efficiency. The difficulty, however, comes in determining desired effects, deciding how to best achieve those effects, accurately predicting effects of actions taken, and accurately assessing the effectiveness of actions taken. These interrelated concepts provide the intellectual basis for developing and executing military strategy and ultimately achieving conditions necessary to attain strategic objectives. In that regard, all of these concepts have strategic significance—they are driven by strategic guidance and direction and they influence strategic decisions.

This paper examines the relationship of key concepts associated with military strategy-COG analysis, targeting for effect and measuring success. It begins with a review of those conditions necessary for effective application of these concepts, followed by an examination of how these concepts played out in Desert Storm.

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ACKNOWLEDGMENTS

This paper puts forth a set of conditions necessary for the effective application of center of gravity analysis, targeting for effect and measuring success. These insights are synthesized from a series of lessons developed for the Theater Air Campaign Studies block of instruction at Air Command and Staff College (ACSC), Maxwell Air Force Base, Alabama. I served as the course director and developed two lessons on targeting for effect and targeting and measuring success. A third lesson entitled, COG Analysis: The Consequences of Failure, was developed by one of my ACSC colleagues, Dr. Richard Muller. Dr. Muller is currently serving as the War Theory and Campaign Studies Department Chairman at ACSC. I owe him a debt of gratitude for the ideas put forth in his lesson, as well as his tutelage in military history and critical analysis.

THE RELATIONSHIP OF CENTER OF GRAVITY ANALYSIS, TARGETING FOR EFFECT, AND MEASURING SUCCESS

Policy sets the ends and provides the means; military strategy is the plan to achieve the desired ends with the available means.¹

Military strategy is an extremely complex process where decisions and actions are interrelated and interactive. A key aspect of this process is an intimate understanding of the interrelationship of center of gravity (COG) analysis, targeting for effect, and measuring success, as well as conditions necessary for effective application of these concepts. The goal of any strategy is to achieve the most decisive, far-reaching effects with maximum efficiency. The difficulty comes in determining desired effects, deciding how to best achieve those effects, accurately predicting effects of actions taken, and accurately assessing the effectiveness of actions taken. These concepts provide the intellectual basis for developing and executing military strategy and ultimately achieving conditions necessary to attain strategic objectives. In that regard, all of these concepts have strategic significance—they are driven by strategic guidance and direction and they influence strategic decisions.

This paper examines the relationship of key concepts associated with military strategy-COG analysis, targeting for effect and measuring success--to include a postulation of those
conditions necessary for effective application of these concepts. Following a brief explanation of
each of these conditions is an examination of how these concepts and conditions played out in
Desert Storm.

To ensure a common frame of reference, the COG concept used in this paper is based on a variation of the Joint Pub 3-0, Doctrine for Joint Operations, definition.

It is that characteristic, capability, or location from which [alliances, nations, and] military forces derive their will to fight, their physical strength, or freedom of action. At the strategic level, centers of gravity might include a military force, an alliance, national will or public support, a set of critical capabilities or functions, or national strategy itself.²

Key insights can be drawn from a variety of historical campaigns about the conditions necessary for effective COG analysis, targeting for effect, and measuring success. While seemingly obvious, history is replete with examples where the following conditions were not fully understood.

- Establishing clear and coherent strategic and military objectives
- Discerning enemy objectives
- Comprehending the enemy system (political, economic, social, and military systems)
- Understanding desired effects and measures of success
- Knowing the time-frame one is operating within
- Recognizing potential constraints on the application of military power
- Understanding conditions necessary for a better state of peace

Strategic objectives are ultimately what the nation wants to achieve as a result of its actions. These actions are typically a coordinated effort, using the appropriate mix of the national instruments of power--political, economic, military, and informational. Logically, military objectives translate strategic objectives into operational terms and reflect conditions achievable by some form of military action. In an article entitled, "Operational Logic: Selecting the Center of Gravity," the authors focus on the inviolate connection between the strategic objectives and the COG.

The strategic center of gravity serves as the link between strategic aims and the operational employment of forces. Strategic and operational centers of gravity do not exist in isolation from the national and military strategic aims established for

the conduct of war....centers of gravity must be appropriate to the political aims and the nature of the conflict.³

Their premise is that each potential COG should be tested for validity and feasibility. Validity refers to whether affecting that COG will contribute to attainment of strategic objectives whereas feasibility addresses the ability to affect that COG. 4 Although a COG may not be feasible, due to the lack of capability or political will, it remains valid. Strategists must, however, note that if the COG cannot be affected, it will not be possible to attain objectives. Strategic level decisions must then be made to either adjust objectives according to what is realistically attainable by military action or apply a different combination of the instruments of power. It then follows that determining the validity of centers of gravity is based wholly on the objectives we hope to achieve--hence the need for clearly defined, coherent, and attainable objectives. As a case in point, "The [Rolling Thunder and Linebacker] air campaigns against North Vietnam differed in their effectiveness as political instruments, and the political objectives guiding them contributed to the disparity of results." One could argue that the COGs for Rolling Thunder were not appropriate to the political aims or the nature of the conflict. Additionally, the COGs failed the feasibility test due to both lack of capability and political will. During the Linebacker campaigns, the political aims were more limited in scope and the nature of the conflict had changed significantly. The lifting of key political restrictions and improved capability also made affecting COGs more feasible.

Just as important, but often overlooked, is the need to fully understand the enemy's objectives and their impact on COG determination. Vietnam is also particularly illustrative of this point. As one account notes, "Perhaps the biggest error made by American strategists was not realizing that the enemy was fighting an unlimited war." The inability to recognize the

"totality" of the North's objectives combined with considerable political restraint in the application of military power adversely affected our ability to correctly determine the COG as well as our ability to affect the COG. Understanding the extent of the enemy's political goals is essential to identify those critical capabilities that allow the enemy to achieve those goals.

Comprehending the enemy system relates to viewing the system as a whole. In simplistic terms, the enemy system includes its political, military, social and economic structures. Viewing the system as a whole means not only knowing the locations, strengths, and weaknesses of individual elements but also understanding the interdependencies among those elements. In other words, the importance of a single entity lies in its relationship to other entities within the system. "If we are going to think strategically, we must think of the enemy as a system composed of numerous subsystems. Thinking of the enemy in system terms gives us a much better chance of forcing or inducing him to make our objectives his objectives and doing so with the minimum effort and the maximum chance of success."

Strategic and operational level analysis of the enemy system identifies the relationships and interdependencies of entities within the system. This analysis provides the basis for determining how to decisively affect COGs. In the Combined Bomber Offensive against Germany, air planners focused on destroying Germany's warmaking capacity; in effect, the German industrial system was the COG. Air planners believed the economic, social, and military systems were interconnected and strikes against key centers could disrupt the equilibrium of the entire system, eventually bringing about its collapse. Their concern was to determine how best to affect the industrial system. In other words, they had to identify which target components within the system to attack and determine how striking these targets would

affect the overall system. As one of the air planners explains, they focused on "service systems connecting industries rather than the industries themselves." In their assessment of the enemy industrial system, they concluded that "electrical power was vital to all industries;" transportation was critical for the movement of raw materials, components, and finished products; and oil provided the needed fuel supply for the armed forces. As a minimum, the air planners hoped to achieve a "significant decline in operational effectiveness" by the time of the planned cross-channel invasion. "The maximum [strategic] effect [was to] bring the German nation to terms" by destroying their capacity to resist.⁹

The stated objectives combined with the strategic and operational assessment of the enemy system then provides the foundation for determining how to achieve the desired effects and ultimately how to impact the enemy's COG. "The objective of targeting is to affect, change, modify, or impede enemy activity." The idea of targeting for effect is being able to identify those entities that can cause the most upheaval in the system as a whole.

It is imperative to remember that all actions are aimed against the mind of the enemy command [leadership] or against the enemy system as a whole; thus an attack against industry or infrastructure is not primarily conducted because of the effect it might or might not have on fielded forces; rather, it is undertaken for its direct effect on the enemy system that includes its effect on national leaders who must assess the cost of rebuilding, the effect on the state's economic position in the postwar period, the internal political effect on their own survival and whether the cost is worth the potential gain from continuing the war.¹¹

Strategic effect equates to achieving the most decisive, far-reaching effects; in other words, the consequences are felt throughout the system. A single action will rarely achieve a strategic effect. The idea is to develop a plan where cumulative actions will most efficiently achieve strategic effects. Operational effects typically focus on impairing the enemy's ability to apply military power. Psychological effects are when the consequences of an action impact the

enemy's state of mind. Effects in the psychological realm are quite likely the most difficult to achieve. It is in this area where the potential for unanticipated or unintended effects is greatest and accurately measuring success is most difficult.

The Doolittle raid against mainland Japan in early 1942 is an example of how a single action had effects across the spectrum; in some cases, the effects were not anticipated. It also provides an excellent example of the distinction between "effects" and "effectiveness." From the psychological perspective, the U.S. wanted to let Japan know the U.S. was not down for the count and could reach Japan with its military forces. The desired operational effect was to have Japan retain and even bring some forces back from the perimeter for defense of the homeland.

As the official Japanese history of the Second World War has concluded, Doolittle's raid caused Japanese military leaders to lose face because they had promised that the home islands would never be bombed; led to diversions of Japanese forces; prompted the Japanese army to jump on the bandwagon for the planned Midway operation, at which the Japanese navy would suffer a major defeat; and, aligned the Imperial General Headquarters unreservedly behind the Combined Fleet's Midway-Aleutians plan, which later resulted in a further dilution of Japanese naval strength at the crucial battle of Midway. Thus, the second-order...consequences of the April attack...were far-reaching and profound.¹²

By forcing the Japanese to extend their defense perimeter and creating the conditions for the battle of Midway, the raid indirectly changed the entire character of Japanese strategic ambitions in the Pacific. In this case, the physical effects were not significant in and of themselves, but the indirect effects "proved remarkably effective in other less obvious but far more important ways."

Critical to the process of targeting for effect is to be able to predict with some degree of accuracy the effects of planned actions. As an example, when the Japanese planned their attack against Pearl Harbor, the desired operational effect was to neutralize the US Pacific Fleet long

enough for the Japanese to consolidate their gains in the South Pacific resource zone. At the strategic level, Japan hoped that by the time it had consolidated its position, the U.S. would accept the Japanese seizure as a "fait accompli." However, by attacking the U.S. directly, they achieved the opposite effect. The attack brought together divisive elements in the U.S. government, galvanized political and public support for the U.S. to respond, and brought about the declaration of war against Japan--an unanticipated strategic effect. Understanding the enemy system is essential to accurately predicting effects within that system.

One of the more difficult aspects in this process is measuring success. In a broad sense, the methodology for measuring success should include establishing desired effects based on stated objectives, predicting effects of planned actions, identifying indicators and measures to evaluate actual effects, analyzing all information to determine whether desired effects are achieved and whether those effects are in fact effective, and providing feedback as a basis for future decisions and actions.

Rolling Thunder is illustrative of the potential pitfalls of measuring success when there is a disconnect between predicted and actual effects, indicators, measures, analysis and feedback. Rolling Thunder was a three-year, nine-month air campaign with the desired effects of compelling the North to cease its support to the Viet Cong insurgency under the pressure of aerial bombardment and hindering the flow of men and material through attacks against the transportation system. About 90 percent of the effort was against transportation-related, or interdiction, targets. In December 1967, CINCPAC [Commander in Chief Pacific] stated, "Although men and material needed for the level of combat...continue to flow despite our attacks on LOCs [lines of communications], we have made it very costly to the enemy in terms of

material, manpower, management, and distribution."¹⁵ Yet, in Jan 1968, an estimated 70,000 North Vietnamese and Viet Cong launched the Tet Offensive. The offensive highlighted the fact that Rolling Thunder failed to effectively reduce the flow of men and supplies needed to support the type of enemy operations being conducted in the south or to compel the North to cease its support for the insurgency. ¹⁶ In terms of physical effects, the air assault did cause damage to North Vietnam's small industrial base and rudimentary transportation system, but was not effective in terms of achieving the objectives. Both the civilian and military leadership miscalculated the effect that Rolling Thunder would have on North Vietnam. "Both groups thought that the North's industrial apparatus was vulnerable to air attack and that its vulnerability offered a means to end the war....[They] believed that the threat of industrial devastation would compel Hanoi to end the conflict."¹⁷ A variety of factors fed the disconnect between desired and actual effects—the nature of the war in the south required less logistical support than conventional war, underestimating the enemy's determination and capacity to work around the destruction, and not assessing whether the remaining capacity was sufficient to supply the enemy's needs.

Further complicating the process are a variety of factors that can influence the feasibility of affecting the COG. In the case of Vietnam, political restrictions were such that military objectives became infeasible; geographic restrictions were placed on both air and land operations. Technological limitations combined with geography and weather also hindered the application of military power in Vietnam. During the Combined Bomber Offensive against Germany in World War II, limited resources and diversion of effort initially precluded strikes against key systems considered vital to the German industrial system. Likewise, in the World War II Pacific campaigns, the mere expanse of the theater combined with limited resources and

logistics issues, precluded early and direct action against centers of gravity. Restrictive factors might include, but are not limited to, domestic and international politics, coalition issues, rules of engagement, the Law of Armed Conflict, available resources, technology, other priorities, and the physical environment. In any case, military strategists must be aware of factors that may inhibit military action; specifically, military strategists must understand how these factors may affect the ability to influence centers of gravity and to achieve stated objectives. At the same time, military strategists must be aware of how such factors as advanced technologies and operational concepts can enhance options when fully exploited.

The element of time is another factor that can affect targeting and measuring success. During the Combined Bomber Offensive against Germany, "considerations of how long the war would last, how Germany would be defeated, [and the timing of Overlord] played a decisive role in determining the selection of target systems" and measuring effectiveness against COGs as a whole. Throughout 1943, the timing for Overlord was unknown, yet essential in the target development stage. Attacks late in the production cycle have a more immediate and direct effect on the military (operational effect). Attacking targets deeper in the economy have a broader and longer lasting strategic effect, but would require more time for the effects to be felt. Such decisions depended upon the planned timing for the cross-channel invasion. Lacking information on the timing of the invasion hindered the ability to decide where to concentrate efforts and, thus, hindered the overall development of a viable and agreed upon strategy. In other words, knowing the time-frame one is operating within, to include understanding the time required for effects to be felt, is important when determining how best to affect enemy COGs and how to measure success.

Finally, military strategists must consider how each action, and specifically how affecting the COGs, will ultimately affect the better state of peace. In their book, From Lexington to Desert Storm, the authors postulate that "future wars...are likely to be limited in scope and purpose....We are not envisioning great crusades against some monstrous Hitler figure; rather we are looking at carefully measured applications of force to accomplish a limited goal."

A review of Desert Storm will help to further illustrate some of these points. This examination will also provide a framework for the implications of emerging concepts, such as parallel attacks and effects-based targeting, for COG analysis, targeting for effect, and measuring success.

Objectives for the initial deployment of forces--Desert Shield--were centered on deterrence and defense, should deterrence fail. When it was determined that the increased political, economic, and military pressure was not providing the persuasion necessary for Saddam to back down, the National Command Authority decided to transition from a defensive to offensive posture.

[T]he transition from Desert Shield to Desert Storm [was] more than an operational shift from a defensive to an offensive phase....The real transformation [occurred] at the level of strategy and policy. It [entailed] a qualitative change from deterrence to compellance, from containment to coercion, and from leaving the initiative with the opponent to seizing the strategic initiative in order to shape the postwar environment.²¹

While clearly stated objectives may not always guarantee success, they are necessary to ensure a reasonable chance of success. Clear objectives are certainly needed to formulate the appropriate mix and application of the political, economic and military instruments of power. Likewise, clearly defined objectives are crucial for determining COGs and desired effects, as well as establishing effective measures of success.

Perhaps atypically, the United States rapidly crafted a coherent grand strategy that involved the use of all instruments of statecraft in response to Iraq's invasion. Four political objectives were set forth with rare clarity: (1) immediate, complete, and unconditional withdrawal of Iraqi forces from Kuwait; (2) restoration of Kuwait's legitimate government; (3) security and stability of Saudi Arabia and the Persian Gulf; and (4) safety and protection of the lives of American citizens abroad.²²

Although the military instrument of power may not always achieve all of the political objectives by itself, it can certainly contribute to establishing the conditions necessary to achieve the desired end state. "Strategic aims elicit strategic centers of gravity that, in turn allow for the establishment of operational goals and the associated centers of gravity." The key is effectively translating political objectives into attainable military objectives. In other words, determine how military action can best be applied to compel the adversary and to help shape the postwar environment. In the case of Desert Storm, military power would be able to directly achieve the objective of an Iraqi withdrawal from Kuwait, to assist in the restoration of Kuwait's government, and to contribute to the postwar regional stability. The military objectives were outlined as follows:

Neutralization of the Iraqi National Command Authority's ability to direct military operations; ejection of Iraqi forces from Kuwait and destruction of Iraq's offensive threat to the region; destruction of known nuclear, biological, and chemical (NBC) weapons production and delivery capability, to include Iraq's known ballistic missile program; and assistance in the restoration of the legitimate government of Kuwait.²⁵

Desert Storm was an excellent and perhaps atypical example of clearly defined and coherent strategic and military objectives. Such clarity and coherency greatly facilitated the determination of centers of gravity.

[Central Command] CENTCOM-defined centers of gravity [included]: (1) command, control, and leadership of Saddam Hussein's regime, (2) Iraqi NBC capabilities, and (3) the Republican Guard. Disconnecting Hussein from his military forces and/or the people of Iraq might compel him, for pure survival

reasons, to comply with coalition demands. Destroying his NBC capability would reduce Iraq's threat to other states in the region. Eliminating the Republican Guard would reduce Iraq's capability to defend Kuwait and its ability to threaten other states.²⁶

Saddam's overarching goal could be characterized as maintaining his power and regime. He was also interested in enhancing his military power, particularly development of a robust weapons of mass destruction program, as a means to dominate/influence the region. With regard to specifically annexing Kuwait, Iraq viewed it as a means to gain economic power and influence. Prior to the invasion, Iraq wanted to shift the border with Kuwait for a more favorable Iraqi position vis-à-vis oil resources, forgiveness of its debt with Kuwait, and control of two islands that blocked Iraq's access to the Gulf.²⁷ In relation to the COGs, coalition operations were focused on critical capabilities needed for Saddam Hussein to achieve his goals.

Additionally, efforts to destroy Iraq's offensive capability were directly related to the better state of peace with regard to regional security.

Based on the objectives and defined COGs, CENTCOM developed a four-phase plan of operations. The initial phase was a strategic air attack "designed to isolate the Iraqi leadership from their fielded forces, to destroy their ability to command and control their forces effectively, and to destroy Iraqi nuclear, biological, and chemical warfare research, production and storage facilities." The second and third phases concentrated on air attacks in the Kuwaiti theater of operations in preparation for the final phase of the combined air and ground offensive to eject Iraqi forces from Kuwait.

The basis for the air operations was a plan called Instant Thunder developed by Colonel John Warden. Col Warden developed a five-ring model of the enemy system, consisting of leadership, system essentials, infrastructure, population, and fielded forces.²⁹ In his article,

"Strategic Warfare: The Enemy As A System," Col Warden states, "We must think in systems terms; we and our enemies are systems and subsystems with mutual dependencies. Our objective will almost always involve doing something to reduce the effectiveness of the overall system."

Specifically, the planners were hoping to achieve a catastrophic collapse of the system.

Applying this concept, the planners identified twelve target categories considered critical to Iraq's COGs. 31

Leadership command facilities; electricity production facilities; telecommunications and command, control, and communications (C3) nodes; strategic integrated air defense system; air forces and airfields; NBC research, production, and storage facilities; Scud missiles, launchers, and production and storage facilities; naval and port facilities; oil refining and distribution; railroads and bridges; army units, including Republican Guards; and military storage and production sites.³²

Regarding overall effects, Col Warden envisioned the capability to strike multiple, key targets across the enemy system and subsystems, in parallel, with the intent of bringing about strategic paralysis; "we make it physically impossible for him to oppose us." In terms of feasibility, advanced technology and available resources certainly facilitated execution of such a plan. According to one account,

The coalition's vast resources allowed the first three phases to begin nearly simultaneously on 17 January 1991. But the heavy emphasis was on the strategic attack against Iraqi leadership, C3, air defenses, and the means of industrial and military production and distribution....emphasis would shift toward attrition of Iraqi military forces in Kuwait and...the ground offensive would begin when air attacks had reduced Iraqi combat effectiveness in the Kuwaiti theater of operations by 50 percent.³⁴

In terms of targeting for effect, the planners seemed to maintain constant awareness of the objectives and better state of peace. Specifically, planners wanted to minimize long-term effects on Iraq's economic infrastructure.³⁵ For example,

Because of a U.S. commitment 'to the security and stability of the Persian Gulf,' the Instant Thunder planners did not wish to cripple Iraq's ability to maintain a balance of power in the region after the war. Thus, instead of destroying the country's means of producing and exporting crude oil, coalition airpower would target only internal pumping and storage facilities. This action would affect distribution and usage but would allow a rehabilitated Iraq to reestablish exports after it complied with coalition (i.e., UN) demands.

The plan for measuring success was based more on the effect produced rather than simply on the amount of damage inflicted. The conceptual shift to "effects-based" targeting affected targeting methodology and measuring success.³⁷ "In their [planners] minds, the level of destruction and the duration of its effect on individual targets had little importance compared to the impact of a particular attack sequence on the system and subsystems of the Iraqi nation-state."³⁸ Such an approach had implications on target selection and targeting science. "For example, disrupting four key nodes at a critical juncture is likely to cause more than four times the systemic dislocation caused by completely destroying one of the four nodes."³⁹ The cumulative effect becomes more important, but perhaps more difficult to measure. The Gulf War Air Power Survey assessed both the direct and indirect effects in an attempt to measure effectiveness at the strategic and operational levels. The difficulty comes in not always being able to quantify effectiveness, particularly in the area of strategic attacks. Having said that, the survey concludes:

Strategic air attacks were in some cases less effective than air planners had hoped for or believed, as in the case of the Iraqi nuclear weapons program-by mid-1992, UN Security Council inspection teams had identified and destroyed more of Iraq's nuclear missile programs than had the air campaign. In other cases, such as that of Iraq's electrical power system, the Coalition met its immediate military objectives. In yet other cases such as the L [leadership] and CCC [command, control and communications] target categories, effectiveness cannot be precisely estimated.⁴⁰

As previously stated, CENTCOM wanted to decrease the combat effectiveness of army units by fifty percent in its preparation of the battlefield phase--an important measure of success on which the start of the ground offensive was going to be based. Interestingly, "Central Command's initial counts of equipment destroyed were inflated, but so too was the target base, and the errors are offsetting." Nevertheless, this could have been a costly error.

During the combined air and ground offensive, coalition forces attained the objective of ejecting Iraqi forces from Kuwait, thus establishing the initial conditions necessary for restoring the Kuwaiti government. Regardless, there was some criticism of the decision to cease hostilities before achieving more destruction of the Iraqi armed forces, particularly elements of the Republican Guard. The fog of war precluded an accurate assessment of the enemy's location and status and subsequently an accurate measure of success with regard to this objective. The situation was further compounded by political pressure to cease hostilities as a consequence of the "highway of death."

The primary controversy over Instant Thunder dealt with disagreements over the significance of the opposing army to victory. There are two schools of thought in this regard. Briefly, the first school of thought cites one dictum of the classical theorist, Clausewitz: 'To sum up: of all the possible aims in war, the destruction of the enemy's armed forces always appears as the highest.' The second school of thought focuses on the Clausewitzian principle of political primacy in war...

Nations do things because national leaders decide to do them....In this scheme of things, the best means of achieving the desired end is to apply calculated pressure at key points (i.e., centers of gravity). This stratagem will convince the enemy leadership that resisting is futile or that the cost of resisting is higher than that of acquiescing. Thus, national leadership becomes the principal target in war.⁴³

The initial thrust of Instant Thunder applied the second school of thought. Air planners focused on target systems they believed would affect the "political leadership and its control of the country and the military forces." Others, to include the theater commander, viewed the Republican Guard as a valid COG and wanted a greater level of effort to ensure their annihilation. Defeating the Republican Guard alone would not likely bring about victory, but it was a key element of the regime's power base and provided an offensive capability that could continue to threaten the region. Looking back at measures of success, or effectiveness, one account contends that "Some people will continue to argue that the only meaningful event in the operation was the defeat of the Iraqi army in Kuwait and that strategic attack on leadership and other key nodes had no effect on the outcome of the war." Although the Gulf War Air Power Survey stated that the effectiveness of the strategic air attacks could not be estimated precisely, it did concede that there was likely considerable disruption and dislocation on the functioning of the Iraqi government and its communications.

Perhaps the greatest shortfall was the lack of knowledge about the Iraqi NBC system—a small percentage of facilities had actually been identified during the war. This lack of knowledge can be attributed at least in part to Iraqi success in concealing key elements of this system. With regard to potential delivery systems, particularly Scud surface-to-surface missiles, coalition planners knew the locations of fixed sites but miscalculated the extent of and reliance on mobile launchers. During the war, coalition planners were concerned about Iraqi efforts to draw Israel into the fray in the hopes of subsequently fragmenting the coalition—although Scud attacks were considered by some to be "militarily insignificant" in terms of physical damage, they had the potential to bring about a strategic effect with regard to the coalition. In any case,

the coalition did not know enough about the composition and operation of Iraq's Scud missile force.⁴⁸

The Gulf War Air Power Survey provides two very telling statements regarding the coalition's understanding of the enemy's system.

The choices of target categories were shaped at least as much by doctrinal considerations about the proper offensive use of air power...as by detailed intelligence on targets and target systems in Iraq....the idea of a strategic air campaign rested upon only the most general understanding of Iraq, its society, infrastructure and military capabilities. In general, Coalition intelligence located most fixed installations throughout Iraq but did not always appreciate the significance of every installation in relation to target systems.

The lack of understanding the system was exacerbated by a problematic relationship between planners and intelligence. According to the Gulf War Air Power Survey, "Theater intelligence personnel did not take part in the many ad hoc discussions that refined the Instant Thunder concept. This meant that they could not anticipate Black Hole [planner's] requirements." Essentially, without fully understanding the overarching effects-based targeting concept, intelligence specialists had difficulty supporting the targeting process to include target selection, weaponeering and combat assessment.

Time was an issue in so far as no one really knew how long the war would last. In that sense, one of the desired effects of attacks against oil was to limit the fuel and lubricants available to Iraqi military forces for military operations. "If the ground campaign had become protracted, the efforts against oil might have eventually paid military dividends on the ground...but attacking oil refineries and storage in Iraq bore no significant military results due to the swift collapse of the Iraqi army." Additionally, the concept of parallel attacks, with the

intent of achieving a systemic collapse, meant that "cohesion, time, and tempo of the entire campaign (i.e., which targets, when, and how) became critical considerations." ⁵²

Finally, the ability to accurately measure effectiveness continued to challenge planners. The difficulty was due in large part to the overwhelming demands placed upon the system by the pace and scale of the operations as well as the little understood effects-based targeting concept. According to the Gulf War Air Power Survey, "There were many contributing causes [for problems associated with measuring success]: some organizational, some procedural, and some technical. Some limitations were not failings at all; they were simply limits of what could be known or observed." It is clear that as a minimum everyone involved in the targeting process must be knowledgeable of the overarching concept of operations. Planners and intelligence personnel must work together to predict effects and to develop a methodology for measuring the effectiveness of actions taken. All parties must understand desired and predicted effects in order to effectively analyze results. Additionally, intelligence systems and personnel need to be attuned to the implications and requirements of effects-based targeting with regard to targeting methodology and measuring success.

Advanced information technologies, precision-strike capabilities, stealth, and stand-off weapons facilitated the execution of Desert Storm, particularly applying the concept of parallel attack and achieving both operational and strategic paralysis more efficiently. These factors also have certain implications with regard to COG analysis, targeting for effect, and measuring success. Obviously, increased information should facilitate analysis of the enemy system and decisions on how best to achieve desired effects, but it also becomes necessary to filter the subsequent increase in "noise" from the substance. Likewise, precision strike warfare places

greater demands on intelligence for precise information. Finally, effects-based targeting also places greater demands on the ability to accurately measure success through less tangible and less obvious indicators of effectiveness.

The historical examples illustrate the interrelationship of COG analysis, targeting for effect and measuring success as well as the conditions necessary for effective application of these concepts. Based on the objectives of any military operation, identifying desired strategic effects and COG analysis go hand-in-hand--COGs can be determined, in part, by the overall effects needed to achieve stated objectives. COGs are also determined by the enemy's objectives. If the objectives are what the nation hopes to achieve, then strategists must determine what makes it possible for the enemy to achieve his objectives. Strategic and operational analysis of an enemy system provides the foundation for determining critical capabilities for the enemy as well as how to achieve desired effects--understanding the interdependencies within the enemy system is critical to determining how best to affect the COGs and thus how to efficiently and effectively achieve desired results. Key issues of interest to military strategists are how to predict these effects, to select the military option that best achieves desired effects, and to accurately assess whether the chosen course is effective, i.e., contributing to military and strategic objectives as well as the better state of peace. Planners must also be cognizant of the fact that application of these concepts is affected by a variety of factors that can either constrain or advance options and the results.

The targeting process is dependent upon not only understanding the enemy system, but also understanding the desired effects, or what constitutes success. Predicting effects establishes a baseline for identifying indicators that something is in fact happening and quantifiable

measures--these must be established from the outset as a means to determine the effectiveness of actions taken. Analysis and feedback are critical to closing the loop on the process. If actions are not achieving predicted effects, the planners must determine why and adjust the plan accordingly. Historically, measuring success has been the most difficult aspect in the process. Even after the fact, when greater information is available, there is often disagreement about the effectiveness of attacking one target system over another.

The purpose of this paper was to convey the importance of the need to understand the interrelationship of COG analysis, targeting for effect and measuring success, as well as the variety of conditions that can make a difference between successful or unsuccessful application of these concepts. Developing such an understanding will help in devising a plan to efficiently and effectively achieve the desired ends with the available means.

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ENDNOTES

- ¹ Bard E. O'Neill and Illana Kass, "The Persian Gulf War: A Political-Military Assessment," <u>Comparative Strategy</u>, 11, no. 2 (Apr-Jun 1992): 223.
- ² Joint Chiefs of Staff, <u>Doctrine for Joint Operations</u>, Joint Pub 3-0 (Washington D.C.: JCS, 1 February 1995), III-20.
- ³ Bill Mendel and Lamar Tooke, "Operational Logic: Selecting the Center of Gravity," <u>Military Review</u> (June 1993): 3-4.
 - ⁴ Ibid., 5-6.
- ⁵ Mark Clodfelter, <u>The Limits of Air Power, The American Bombing of North Vietnam</u> (New York: The Free Press, 1989), 204.
- ⁶ Donald M. Snow and Dennis M. Drew, <u>From Lexington to Desert Storm: War and Politics in the American Experience</u> (Armonk, NY: M. E. Sharpe Inc., 1994), 237.
- ⁷ John A. Warden, "Strategic Warfare: The Enemy as a System (Draft)," (Air Command and Staff College, Maxwell Air Force Base, Alabama, 1993), 2.
- ⁸ Haywood S. Hansell, <u>The Air Plan That Defeated Hitler</u> (Atlanta, GA: Higgins-McArthur/Longino and Porter, 1972), 80.
 - ⁹ Ibid., 84-85.
- ¹⁰ U.S. Department of the Air Force, <u>Target Intelligence Handbook</u>, Air Force Pamphlet 200-18, Vol. 1 (Washington D.C.: U.S. Department of the Air Force, 1 October 1990), 5.
 - 11 Warden, 19.
- ¹² Barry D. Watts and Thomas A. Keaney, <u>Gulf War Airpower Survey</u>, vol. 2, part 2, <u>Operations and Effects and Effectiveness</u> (S/NF/WN/NC) (Washington D.C.), 53.
 - 13 Ibid.
 - ¹⁴ Clodfelter, 194.
 - ¹⁵ Ibid., 112.
 - 16 Ibid.
 - ¹⁷ Ibid., 139.
- Alfred C. Mierzejewski, The Collapse of the German War Economy, 1944-1945 (Chapel Hill: The University of North Carolina Press, 1988), 64.
- ¹⁹ Ibid., 75, 181-182. With regard to the timing of the land invasion and target development, Mierzejewski explains, "If the goal of the air offensive were simply to weaken the Wehrmacht in conjunction with land campaigns, then target systems fairly late in the production cycle would be selected. That is to say, they would choose sites of final production of armaments or the manufacture of components closely related to completed products because their loss would have direct military effects in fairly short order. But if the invasion would be

long postponed, the goal could become the general weakening of the Reich economy because more time would be available. Then they could select target systems deeper in the economy, which were farther removed from final production and where greater stockpiles were kept. A successful attack on these systems would take longer but would result in a more complete disruption of the German economy." The issue became a debate between striking the synthetic fuel refineries and crude oil processing facilities or the transportation system.

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<sup>20</sup> Snow and Drew, 352.
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²⁶ Edward C. Mann III, <u>Thunder and Lighting</u> (Maxwell Air Force Base, Alabama: Air University Press, 1995), 91.

²⁹ In his article "Strategic Warfare: The Enemy as a System," Colonel Warden's model consists of five concentric rings with the most important objective, leadership, in the center. Leadership provides the control and direction of all subsystems and ultimately decides whether to concede to our objectives. Command, control, and communications will typically fall into the leadership ring. The second ring consists of system essentials and refers to "those facilities or processes without which the state or organization cannot maintain itself." When talking about a state, system essentials are typically the sources of energy such as electrical power, oil, or even money. The third ring, infrastructure, primarily refers to the various transportation systems (sea, land, and air) or the means of distribution of goods and services. It also consists of the majority of a state's industry. The fourth ring, population, can include attempts to affect the morale or will of the people. The fifth and outer ring consists of the fielded forces whose function is to protect the inner rings. 14-18.

³⁵ Thomas A. Keaney and Eliot A. Cohen, <u>Gulf War Air Power Survey Summary Report</u> (Washington D.C., 1993), 71.

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<sup>36</sup> Mann, 41.
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²¹ O'Neill and Kass, 219.

²² Ibid.

²³ Mendel and Tooke, 6.

²⁴ O'Neill and Kass, 224.

²⁵ Ibid.

²⁷ Bob Woodward, <u>The Commanders</u> (New York: Simon Schuster, 1991), 252.

²⁸ Drew and Snow, 301.

³⁰ Ibid., 31.

³¹ Mann, 37.

³² Ibid., 39.

³³ Warden, 4.

³⁴ Mann, 65.

³⁷ Ibid., 106.

- ³⁸ Ibid., 72.
- ³⁹ Ibid., 100.
- ⁴⁰ Keaney and Cohen, 90.
- ⁴¹ Ibid., 106
- ⁴² Mann, 34.
- ⁴³ Ibid., 35.
- ⁴⁴ Ibid., 79.
- ⁴⁵ Ibid., 78.
- ⁴⁶ Ibid., 104.
- ⁴⁷ Keaney and Cohen, 70.
- ⁴⁸ Ibid., 123.
- ⁴⁹ Ibid., 138-139.
- ⁵⁰ Ibid., 130.
- ⁵¹ Ibid., 77.
- ⁵² Mann, 108.
- ⁵³ Keaney and Cohen, 139.

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